IN THE UNITED STATES DISTRICT COURT
WESTERN DISTRICT OF TEXAS
MIDLAND/ODESSA DIVISION

VIRTAMOVE, CORP.,
 	
    Plaintiff,
 	
              v.
 	
AMAZON.COM, INC.;
AMAZON.COM SERVICES LLC; AND
AMAZON WEB SERVICES, INC,
 	
    Defendants.
	Case No. 7:24-CV-00030-ADA-DTG

EXPERT DECLARATION OF DR. DARRELL LONG
REGARDING CLAIM CONSTRUCTION

TABLE OF CONTENTS

I.   INTRODUCTION

1.   I have been retained by counsel for Defendants Amazon.com, Inc., Amazon.com Services LLC, and Amazon Web Services, Inc. (collectively "Amazon") to provide technical assistance in this action.

2.   I understand that Plaintiff VirtaMove, Corp. alleges that Amazon infringes U.S. Patent Nos. 7,519,814 (the "'814 patent") (Dkt. No. 1-1) and 7,784,058 (the "'058 patent") (Dkt. No. 1-3). My declaration relates to the indefiniteness of claim limitations in the '814 patent and the '058 patent.

II.   BACKGROUND AND QUALIFICATIONS

3.   I am over the age of 18 and am competent to write this declaration. I have personal knowledge or have developed knowledge of these technologies based upon education, training, or experience of the matters set forth herein.

A.   General Work Experience and Professional Background

4.   I am currently Distinguished Professor emeritus of Engineering in the Jack Baskin School of Engineering at the University of California, Santa Cruz. My previous work experience includes serving as Director of the Center for Research in Systems and Storage, a National Science Foundation Industry/University Cooperative Research Center, and the founding Director of the Storage Systems Research Center at the University of California, Santa Cruz. Before that time, I was a research assistant at the University of California, San Diego, and a lecturer in Mathematics at San Diego State University. After coming to the University of California in 1988, I worked up through the ranks from Assistant to Associate to full Professor, culminating in my appointment as Distinguished Professor (the highest rank at the university). All this experience is covered in my curriculum vitae (attached as **Appendix 1**), which provides a more detailed recitation of my employment history and tenure at various jobs.

5. I have also held numerous positions at the University of California and various government agencies and laboratories. In particular, I served as the vice chair and later chair of the University of California Committee on Research Policy. I have served on the University of California President's Council on the National Laboratories and on the Science & Technology, National Security, and Intelligence committees for those laboratories. I also served on the University of California Academic Council Special Committee on Laboratory Issues (ACSCOLI). I served for several years on the National Research Council's Standing Committee on Technology Insight-Gauge, Evaluate and Review (TIGER), on the Committee on Defense Intelligence Agency Technology Forecasts and Reviews, and on the National Research Council's Committee on Science and Technology for Defense Warning. I recently served on the Intelligence Science and Technology Experts Group (ISTEG) for the National Academies of Sciences, Engineering, and Medicine.

6. Additionally, I have held visiting faculty positions at the Université Paris–Dauphine (Paris IX), the Conservatoire National des Arts et Métiers, the Université Paris–Descartes (Paris V), Sorbonne Université, the University of Technology, Sydney, the Center for Communications Research, the United States Naval Postgraduate School and Professor *ad Honorem* de la Universidad Católica del Uruguay. I was a European Organization for Nuclear Research (CERN) Associate Member.

7. I am conversant with several computer languages (for example, C, C++, FORTRAN, Go, LISP, Pascal, Perl, Java and others), scripting languages (various Unix/Linux shells, JavaScript, Python, and TcL), markup languages (HTML, XHTML, XML, and numerous XML applications), operating systems (Unix and Linux of all varieties; MacOS; NetWare; Windows NT; Windows 2000, XP, Vista, Windows 7, 8, and 10, and Windows Server 2003, 2008, 2012, and 2016), and

network communication protocols (TCP/IP IPv4 and IPv6, plus numerous older stacks including IPX/SPX, NetBIOS/NetBEUI, and AppleTalk).

B.   Education

8.   I graduated from San Diego State University in 1984 with a B.S. degree in Computer Science. Additionally, I studied at the University of California, San Diego, during which I earned a Master of Science in Computer Science in 1986 and a Ph.D. in Computer Science in 1988.

C.   Professional Societies and Committee Memberships

9.   I have been involved in coordinated research efforts with my peers in the field and with professional societies in the computer science field. I have held numerous committee memberships throughout my career.

10.   I currently am a member of various professional societies, including the Association for Computing Machinery (ACM), the Institute of Electrical and Electronics Engineers (IEEE), and the American Association for the Advancement of Science (AAAS). I was elected a Fellow of the IEEE in 2006, and a Fellow of the AAAS in 2008. I served on the IEEE Fellows Evaluation Committee in 2007, 2010, and from 2011 to 2014. From 2011 to 2012, I was a Member and Chair Emeritus for the IEEE Reynold B. Johnson Information Storage Systems Award Committee. From 2008 to 2011, I served as the Chair for the IEEE Reynold B. Johnson Information Storage Systems Award Committee and was a member of the IEEE Technical Field Awards Council. I am the inaugural Editor-in-Chief of the IEEE Letters of the Computer Society (LOCS), the Editor-in-Chief *emeritus* of the ACM Transactions on Storage (TOS). In 2002, I founded the Conference on File and Storage Technologies (FAST), one of the most prestigious venues in the computer data storage field.

11.   I am also a member and fellow of various associations. I am a member of the Armed Forces Communications & Electronics Association, American Society for Engineering Education, Usenix Association, Sigma XI (Scientific Research Society), IEEE Computer Society, and the Association for Computing Machinery. Additionally, I am a fellow of the American Association for the Advancement of Science and the Institute of Electrical & Electronics Engineers.

D.   Publications and Patents

12.   I have contributed to over 200 computer textbooks, trade books, articles, white papers, technical briefs, other publications, and various patent applications. I was a co-author of a book titled *Avoiding Surprise in an Era of Global Technology*, which was peer-reviewed and published in 2005. In 1989, I co-authored another scholarly book with John L. Carroll titled *Theory of Finite Automata*. I have co-authored chapters of various books, including *Distributed Data & Structures 4*, *Multimedia Communications: Directions and Innovations*, *Network Systems Design*, and *Progress in Simulation II*.

13.   I have co-authored various peer-reviewed journals in the space of secure computing, big data, computer systems, magnetics, and data storage. In particular, these peer-reviewed journals include *ACM Transactions on Storage, ACM/Baltzer Mobile Networks and Applications Journal, Cluster Computing Journal, Computer Networks, Computing Systems, Future Generation Computer Systems, IEEE Latin America Transactions, IEEE Micro, IEEE Transactions on Big Data, IEEE Transactions on Cloud Computing, IEEE Transactions on Computers, IEEE Transactions on Dependable and Secure Computing, IEEE Transactions on Knowledge and Data Engineering, IEEE Transactions on Magnetics, International Journal in Computer Simulation, Internet Computing, Journal of Software Engineering and Knowledge Engineering*, and *the Journal of the ACM*.

14. I am a co-inventor on eleven different patent applications that have been issued. These patents include, for example, U.S. Patent No. 5,889,992, titled "Predictive Event Tracking Method," U.S. Patent No. 6,405,315, titled "Decentralized Remotely Encrypted File System," and U.S. Patent No. 6,792,424, titled "System and Method for Managing Authentication and Coherency in a Storage Area Network."

15. I have written widely and voluminously for a broad range of computing publications and computing-oriented articles. As previously noted, my curriculum vitae (attached as **Appendix 1**) provides as comprehensive a record of these publications as I have been able to assemble.

16. Based on my education and experience, I am an expert in the field of computer operating systems and operating environments. I have used my education, years of experience in this field, and my understanding of the perspective of a person of ordinary skill in the art to form the opinions expressed in this declaration.

III.   OPINIONS AND ANALYSIS

17. Counsel informs me that the parties in this litigation dispute the scope of certain claim limitations in the '814 and '058 patents. I have been asked to provide my opinion about how a person of ordinary skill in the art would interpret the disputed limitations.

E.   Legal Standards for Claim Construction

18. This section describes my understanding of relevant legal standards based on information provided to me by Amazon's counsel—not my personal knowledge or expert opinion. I am not an attorney or a legal expert. My understanding of the relevant legal standards simply provides context for my technical opinions set forth herein.

19. I understand that claim limitations must be viewed from the perspective of a person of ordinary skill in the art to which the patent pertains as of the patent's priority date.

20.   I understand that a claim limitation is generally given the plain and ordinary meaning that a person of ordinary skill would ascribe to it when viewed in the context of the patent's claims, specification, and prosecution history. A construction different from the plain and ordinary meaning may be adopted based on the patentee's lexicography or due to a disavowal of claim scope.

21.   I understand the patentee may act as his own lexicographer and that such lexicography occurs when the patentee clearly expresses an intent to redefine a term or provides an express definition of a term.

22.   Disavowal occurs when clear and unequivocal statements in the specification or prosecution history indicate that the claimed invention requires the presence or absence of a particular feature. For example, disavowal may occur when the specification or prosecution history distinguishes prior art as lacking a particular feature. In this example, the disavowal would indicate that the invention in the patent requires the feature used to distinguish the prior art.

23.   I understand that a patent and its prosecution history (also known as the file history) are considered "intrinsic evidence" and are the most important sources for interpreting claim language in a patent. The prosecution history of related patents and applications, including foreign patent applications, is also relevant.

24.   I understand that sources extrinsic to a patent and its prosecution history (such as dictionary definitions and technical publications) may also be used to help interpret the claim language but that such extrinsic sources cannot be used to contradict the unambiguous meaning of the claim language that is evident from the intrinsic evidence.

25.   I understand that when a person of ordinary skill would be unable to ascertain the scope of a claim with reasonable certainty, the claim is indefinite and, therefore, invalid.

26.   I understand that a patentee's definition of a claim term can render a patent claim indefinite if an ambiguity in the definition would prevent a person of ordinary skill from ascertaining the scope of the claim with reasonable certainty.

F.   Level of Ordinary Skill in the Art

27.   I understand that the '814 patent claims priority to an application filed on September 15, 2003, and that the '058 patent claims priority to an application filed on September 22, 2003. As of September, 2003, a person of ordinary skill in the art of computer operating systems and operating environments would have a bachelor's degree in computer science, computer engineering, or a similar field, and approximately two years of industry or academic experience in a related field.

28.   My opinions and conclusions below would remain the same even if the priority date, field of invention, or level of ordinary skill were slightly different.

G.   The '814 Patent

29.   The '814 patent is entitled "System for containerization of application sets." It relates to containerization of software applications, wherein an application is placed in a "container" that contains "all files required to successfully execute a set of software applications on a computing platform." ('814 patent at 7:22-29.) The '814 patent explains that applications are able to run securely from within containers because they can access files within their container but are unable to access files located outside of that container. (*Id.* at 8:66-9:7.)

30.   The '814 patent claims methods for providing servers with secure containers that contain software applications. ('814 patent at claim 1.) Specifically, it claims methods for storing containers in a system with multiple servers operating in "disparate computing environments." (*Id.*)

H.   The '058 Patent

31.   The '058 patent is entitled "Computing system having user mode critical system elements as shared libraries." It relates to replicating so-called "critical system elements" from an operating system's kernel to a shared library that can be accessed by software applications outside of the kernel. ('058 patent at 1:46-48, 5:22-34.)   Some examples of critical system elements are networking protocols and a computer's file system. (*Id.* at 6:11-28.)

32.   The '058 patent claims systems that contain critical system elements "for running in kernel mode" as well as "functional replicas" of those critical system elements that are stored in a shared library. ('058 patent at claim 1.) These functional replicas can be accessed directly by multiple software applications to provide unique instances of the functional replica to each application that accesses the shared library. (*Id.*).

I.   Claim Constructions

1.   '814 Patent Claim Limitations

a.   "operating in disparate computing environments"

33.   Claim 1 recites "a system having a plurality of servers … operating in disparate computing environments." In the context of the '814 patent, "disparate computing environments is defined as "Environments where computers are stand-alone or where there are plural computers and where they are unrelated." ('814 patent at 2:16-19.)

34.   Because the specification clearly states that "[t]he following definitions are used herein" (*id.* at 2:16) before providing the above definition for disparate computing environments, a person of ordinary skill would understand this to be the patentee's chosen lexicography. Thus, a person of ordinary skill would understand claim 1 to require that the claimed servers are "stand-alone" or "unrelated," in accordance with the patentee's definition.

35.   The term "unrelated" is subjective. A person of ordinary skill would recognize that no universal standard existed for determining whether multiple computers are "related" or "unrelated." The person of ordinary skill would expect the patent to explain what "unrelated" means in the context of the alleged invention, but the patent contains no such explanation. Nor have I found such an explanation in the prosecution history. Thus, a person of ordinary skill would not know what the patent means by "unrelated" and would be unable to discern the scope of claim 1 with reasonable certainty. I understand that this makes the claim indefinite.

36.   Claim 1 is also indefinite because it contradicts itself under the patent's definition of "disparate computing environments." The claim recites that the "plurality" of servers (i.e., multiple servers) are part of one "system." For multiple servers to form a single "system," a person of ordinary skill would understand that they must somehow be connected (e.g., networked) or otherwise related to each other. However, this requirement contradicts the patentee's definition of "disparate computing environments," which requires the computers to be "stand-alone" or "unrelated."

37.   Because a plurality of servers that make up a single system are necessarily related and not stand-alone, a person of ordinary skill would be unable to understand with reasonable certainty what the patentee's "stand-alone" or "unrelated" definition requires in the context of the claimed system of multiple servers.

38.   Nothing in the patent or prosecution history provides any explanation of "disparate," "unrelated," or "stand-alone" computing that would resolve the contradiction described above. Thus, it is my opinion that the "operating in disparate computing environments" limitation renders claim 1 indefinite.

39.   The claims that depend from claim 1 are also indefinite because nothing in the dependent claims resolves the contradiction described above.

2.   '058 Patent Claim Limitations

a.   "critical system element"

40.   Claim 1 of the '058 patent recites "an operating system kernel having OS critical system elements" and "a shared library having shared library critical system elements."   Based on my experience, the term "critical system element" had no established meaning in the art at the time of the alleged invention.

41.   The '058 patent provides the following definition of critical system elements:

> a.   "By way of introduction, a number of terms will now be defined. Critical System Element (CSE): Any service or part of a service, 'normally' supplied by an operating system, that is critical to the operation of a software application. A CSE is a dynamic object providing some function that is executing instructions used by applications." ('058 patent at 6:6-10.)

42.   The '058 patent's definition of critical system elements is subjective. The definition states that a critical system element is "any service or part of a service, '*normally*' supplied by an operating system that is *critical* to the operating of a software application." (Emphases added.) A person of ordinary skill would not have been aware of any objective standards for deciding whether particular services were "normally" found in operating systems or not. Some services were more common than others, but the patent provides no objective boundaries on how common a service must be before it is considered "normal."

43.   A person of ordinary skill also would not have been aware of any objective standard for deciding whether a service is "critical" to the operation of a software application. A person of ordinary skill would likely envision several different possibilities for defining "critical" but would

not know which of these possibilities the definition encompasses.   For example, is a service "critical" if an application crashes without it? Is a service "critical" if the application does not crash, but some of its functionality becomes inaccessible? Is a service "critical" if the application's functionality is accessible but performs unreliably or incorrectly?   The patent and prosecution history provides no objective standard for determining whether a service is "critical."

44.   The specification provides several examples of critical system elements, such as "[n]etwork services including TCP/IP, Bluetooth, ATM; or message passing protocols" and "File System services that offer extensions to those supplied by the OS."   ('058 patent at 6:11-28.) However, the specification never explains why these examples are "critical" to any application. The examples therefore fail to define any objective boundaries and a person of ordinary skill would be unable to determine with reasonable certainty what "critical system element" encompasses beyond these examples.

45.   Looking beyond the specification, extrinsic evidence confirms that "critical" had no well-defined meaning in the context of software. For example, the IEEE Dictionary, published in 2000, is a technical dictionary that addresses terms used in computer engineering. It does not define the term "critical" but defines several phrases that include "critical" in them and specifically relate to software. One of these terms is "critical piece first (software)," which is defined as follows: "A system development approach in which the most critical aspects of a system are implemented first. The critical piece may be defined in terms of *services provided, degree of risk, difficulty, or other criteria.*" (Emphasis added.) This definition shows that "critical" could be used in multiple ways. There was no limit on the criteria that could be used to judge whether a piece of software is critical.

46.   The IEEE dictionary also defined "criticality" and provided the following definition pertaining to software: "The *degree* of impact that a requirement, module, error, fault, failure, or

other item has on the development or operation of a system." (Emphasis added.) This definition confirms that different aspects of software may have different degrees of criticality. The '058 patent provides no objective boundary for discerning what degree of criticality is required before something becomes a "critical system element."

47. Further, another definition of "criticality" in the IEEE dictionary defines the term as follows: "A *subjective* description of the intended use and application of the system. Software criticality properties may include safety, security, complexity, reliability, performance, or other characteristics." (Emphasis added.) This definition shows that criticality was recognized in the art as a "subjective" quality, not an objective one. I have included the relevant portions of the IEEE dictionary in Exhibit A, attached to this declaration.

48. I have consulted several other dictionaries from around the time of the patent filing and reviewed their definitions of "critical" (or similar terms). (Ex. A.) None of the definitions that I reviewed provided objective boundaries that could be applied to the "critical system elements" in the '058 patent. Because a person of ordinary skill would have no way of objectively determining whether a system element is "critical," it is my opinion that all claims reciting "critical system elements" are indefinite.

b.   "functional replica"

49. Claim 1 also requires that the recited critical system elements (CSEs) in the shared library are "functional replicas" of the CSEs in the operating system.

50. The specification provides the following definition of "replica":

    a. "The term replica used herein is meant to denote a CSE having **similar** attributes to, but not necessarily and preferably not an exact copy of a CSE in the operating system (OS)[.]" ('058 patent at 1:66-2:1 (emphasis added).)

- 12 -

51.   This definition requires a "replica" to be "similar" to a CSE in the operating system, but similarity is subjective. The definition does not specify how similar two CSEs must be for one to be a replica of another or how to measure such similarity. In fact, the definition forecloses the only meaning of "replica" that would be objectively clear—a requirement that a replica be an exact copy. Instead, the definition states that a replica is "not necessarily and preferably not" an exact copy, again leaving entirely open the question of how similar the replica must be to the original. Thus, a person of ordinary skill would be unable to ascertain any objective boundaries for the required similarity.

52.   Nothing in the patent or the prosecution history resolves the uncertainty in the definition. The rest of the patent muddies the water further. For example, the patent states:

> a.   "The CSE library includes replicas or substantial functional equivalents or replacements of kernel functions. The term replica, **_shall encompass any of these meanings_**, and although not a preferred embodiment, may even be a copy of a CSE that is part of the OS." ('058 patent at 8:27-31 (emphasis added).)

53.   This statement unhelpfully uses the word "replica" to define the word "replica," and then adds other poorly defined possibilities. Nothing in this statement provides an objective boundary for measuring similarity or otherwise resolves the uncertainty in the definition above.

54.   The patent also includes the following statement, which indicates that replicas have "essentially the same functionality" as a CSE in the kernel.

> a.   "The term replication means that **_like services_** are supplied. As was described heretofore, it is not necessarily the case that duplicates of the same implementation found in the kernel are provided by a CSE; but **_essentially_**

- 13 -

a same functionality is provided."   ('058 patent at 9:52-56 (emphasis added).)

55.   This statement appears in a discussion of "preferred embodiments." (*Id.* at 9:49-58.) Thus, it is unclear whether this statement applies to all replicas, or just certain embodiments. Regardless, specifying that replicas supply "like services" and "essentially the same functionality" does not provide any objective boundaries. These phrases are seemingly synonymous with the "similar" requirement from the "replica" definition above, but add no further clarity.

56.   The specification discusses the meaning of "replica" and "replication," but does not use the phrase "functional replica," which appears in the claim language. Adding the word "functional" before the word "replica" would not resolve the uncertainty discussed above. In particular, adding the word "functional" provides no objective boundaries for the similarity that the "replica" definition requires.

57.   The patentee used the phrase "functional replica" during prosecution when distinguishing a prior art reference cited by the examiner. I have attached the relevant portion of the prosecution history to this declaration as Exhibit B. The patentee stated:

> a. "Nowhere does Cabrero et al. disclose the SLCSEs stored in the shared library being *functional replicas* of OSCSEs, or *in other words, replacements*." (Ex. B (July 1, 2009 Office Action Response) at 8 (emphasis added).)

58.   This statement in the prosecution history implies that "functional replicas" of operating system CSEs are "replacements" for them. But the statement does not resolve the uncertainty stemming from the subjective definition of "replica" in the specification. A person of ordinary skill would still understand that a replica—even assuming it is a "replacement" for an operating

system CSE—must also be "similar" to the operating system CSE as the definition requires. Because the patentee provided no objective boundaries for measuring such similarity, a person of ordinary skill would not be able to ascertain the scope of the claims with reasonable certainty even after reading the prosecution history. Thus, it is my opinion that the phrase "functional replica" renders all claims that recite that phrase indefinite.

IV. MATERIALS CONSIDERED

59. In addition to my decades of relevant experience, I considered the following materials when preparing this declaration:

    a. the specification and claims the '814 patent;

    b. the specification and claims of the '058 patent;

    c. the prosecution history of the '814 patent;

    d. the prosecution history of the '058 patent; and

    e. any other materials cited in this declaration.

60. I reserve the right to consider any additional materials that are brought to my attention.

V. COMPENSATION

61. I am being compensated for my time at the rate of $750 per hour for my work on this litigation. My compensation is not contingent on the outcome of this litigation.

VI. RESERVATION OF RIGHT TO SUPPLEMENT OR MODIFY

62. I reserve the right to supplement or modify my opinions in the event that additional information comes to my attention.

63. In particular, I reserve the right to supplement my declaration to address the construction of disputed claim limitations in light of any opinions offered by the plaintiff's expert regarding the meaning of the claim language.

I declare under penalty of perjury that the foregoing is true and correct.

Executed on October 19, 2024

Darrell D. E. Long, Ph.D.